

“Blind Mouse” on Mars and on the Moon – a Map Game for Disseminating Planetary Topographic Knowledge

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Abstract. We have developed an online neo-cartographic game that shows the basic landform types of the Moon and Mars and makes the otherwise opaque planetary toponyms more familiar to students. The main goal of this web application is to teach planetary cartography to middle and high school students. It is based on the concept of edutainment, the method of attractive teaching and learning with the help of multimedia applications. The game combines two parallel projects: a development dealing with mute map games in the education of geography, and research on multilingual planetary maps.

Keywords: Planetary maps, Edutainment, Moon, Mars

1. Introduction

Mute maps are traditional tools of teaching geography. Some pupils like them, while others do not. Although their usefulness in strengthening topographic knowledge is doubtless, in this new everything-is-digital era they seem obsolete. Year by year it is getting harder to keep pupils' attention on the subject they are intended to learn, so teachers must keep on finding new and more attractive educational aids to prevent classes from being boring.

The *Blind Mouse mute map game* was launched to give a new weapon to teachers in this struggle. Started as a master thesis in Cartography in 2005 (Dombóvári 2005), this game was designed along the idea of “edutainment”, a mixture of education and entertainment (e.g., Russell 2000,

Kereszturi 2009) in a cybercartographic (Taylor 2005) framework. The simple web game offers a great opportunity to its users to master their topographical skills by playing and competing with others to get better scores (Figure 1).

This is a great tool in education to prepare for the exams at different grade levels, accessible in Hungarian, English, German and Turkish languages. First, the map areas are the same as in the atlases and in schoolbooks. Second, the levels of the game correspond to the Hungarian National Core Curriculum and it is based on the topographic requirements of primary schools, of secondary school final exams and of university geography courses. The currently available detailed geographic themes are Hungary, Turkey, Austria and Europe, while several areas are under construction.

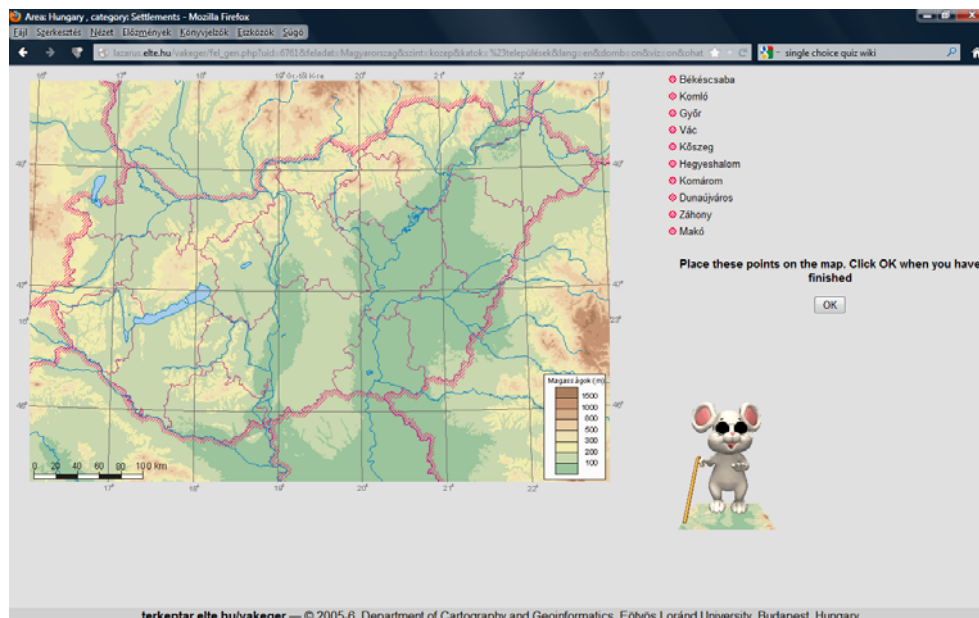


Figure 1. The original Blind Mouse mute map game (<http://vakeger.elte.hu>).

The game soon became popular among primary and secondary school pupils and teachers. Even championships are organized between different schools of Hungary, where competitors have to compare their topographic knowledge by playing this game (Simonné-Dombóvári and Gede 2010).

Although the original game is still popular, the new possibilities of webcartography in the recent years made it a bit old-fashioned. The capacity of WebMapping 2.0 makes it possible to use three-dimensional, steerable-zoomable virtual globes instead of traditional maps in these educational or entertaining programs (Neumann 2008). The developers decided to create

a new version of the game called *Blind Mouse 3D* (Simonné-Dombóvári and Gede 2011), using the Google Earth plug-in as “base map”, naturally without boundaries and labels. (Figure 2)

Pupils can learn with a virtual version of the traditional classroom globe and this second version of the game handles global datasets in addition to national or regional data (such as World Heritage sites, “100 Wonders of the World” and capitals of the World).

This new game’s geographic coverage was then extended outside the Earth, into other solar system bodies. It was recognized that to combine the 3D mute map game with planetary maps results in an effective tool of popularizing planetary topographic knowledge and improving the general knowledge about other planets. There is a multitude of misconceptions and “white spots” in the general knowledge about the nature of the surface of other planets, which is partly a result of the lack of these subjects in elementary and middle to high school education (Hargitai 2008).



Figure 2. Screenshot of the Blind Mouse 3D game (<http://terkeptar.elte.hu/v3d>)

The game, *Blind Mouse on Mars* was realized on the two best-known celestial bodies, the Moon and Mars. Although Google Earth itself also supports these two objects in addition to Earth (Google 2012), we have used the Lunar and Mars globes created by our working group as Google Earth plug-ins. Good quality topographic data are also available on them and surface

features have unique names. (This latter is a very important requirement for a good mute map game.)

2. Overlay Maps

Google Earth visualizes the surface of Mars and the Moon with spacecraft imagery. Although it is very impressive, and gives a nice overview of these bodies, a traditional, abstracted map is more adequate when one has to find objects of different size and nature. Google maps are less suitable for showing the basic characteristics of these bodies as middle or high school children need simplified / generalized and easy to understand maps. Luckily, such globe maps (made for virtual planetary globes) were produced in a parallel project supported by the ICA Commission on Planetary Cartography as part of the series “multilingual maps of the terrestrial planets and their moons” (Shingareva et al. 2005). These globe maps can be draped to the surface of the planets and users can turn their visibility on or off.

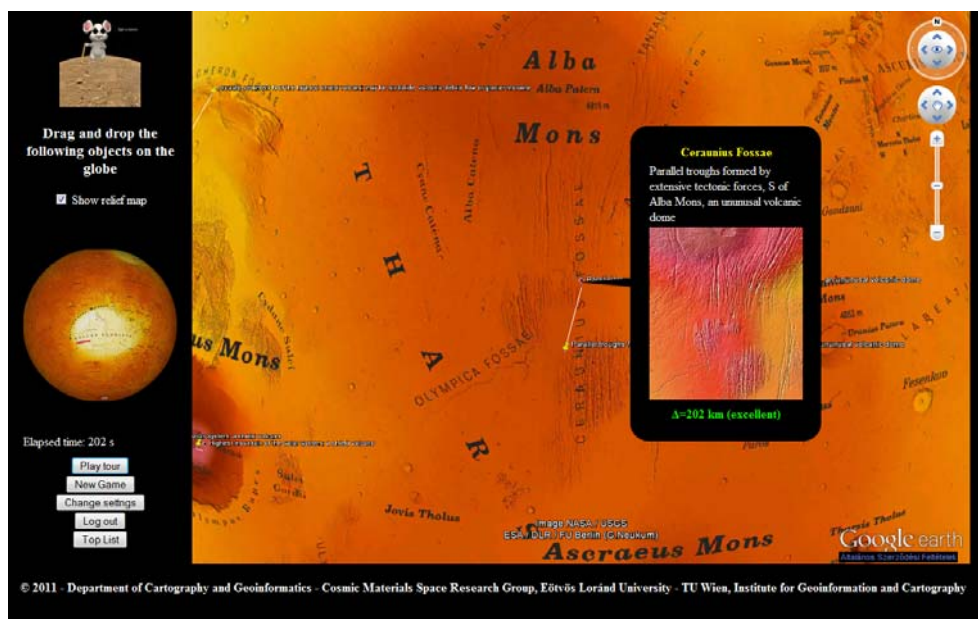


Figure 3. “Tour” layout with answers of the “Blind Mouse on Mars” module (<http://terkeptar.elte.hu/em>).

2.1. Relief Representation

The maps use hypsometric relief representation, using colour schemes designed specially for the given planet and place a special emphasis on the

language and the selection of official and informal planetary place names (Hargitai 2012). Hypsometry is based on digital elevation models of the planets: MOLA for Mars and LRO WAC DTM for the Moon (NASA 2012a, 2012b).

- The map of Mars is displaying a white to yellow, orange and brown colour scheme for coding topographic data. This colouring reflects the true, and somewhat the mental image of the planet. These colours show fewer details than the rainbow colour scheme used by NASA maps, but the perception of topography is enhanced by the use of relief shading (*Figure 3*).
- The same method was used for the creation of the Moon; however, its colours are unquestionably artificial (*Figure 4*). For the Lunar map, blue hues were applied for topographic lows that roughly correspond to maria (lava-covered plains) and orange hues for higher elevations, which mostly correspond to the densely cratered highland terrains. The colour of the highlands (terrae) is “earth”-like, and we assumed that lunar “seas” will not evoke the concept of true water-covered areas even for the younger students.

2.2. Toponyms

In both maps, we have applied the basic cartographic principles of showing place names in a font size that is related to their true geographic dimensions; a feature that is not available in virtual Google maps for physical geographic features. All major landing sites are shown. The coordinate grid is not shown as coordinates can be read from the Google applications, but the equator is displayed with a thick dashed and contoured line, since it greatly helps orientation in the easily rotatable and zoomable globe.

In contrast with the previous, “Earth” versions of the Blind Mouse game, these maps are no longer “mute” (i.e. without toponyms). The reason is that, unlike toponyms of the Earth, planetary feature names are rather unknown for the general public; therefore, the most important role of this game is to disseminate this knowledge. In the Lunar map, nomenclature is bilingual (Latin and English). This nomenclature in various font faces and size as used in paper maps includes not only officially adopted names, but also informal names (for example, basin names) used in astrogeology. Some of the questions are also related to these landforms, which have no official names.

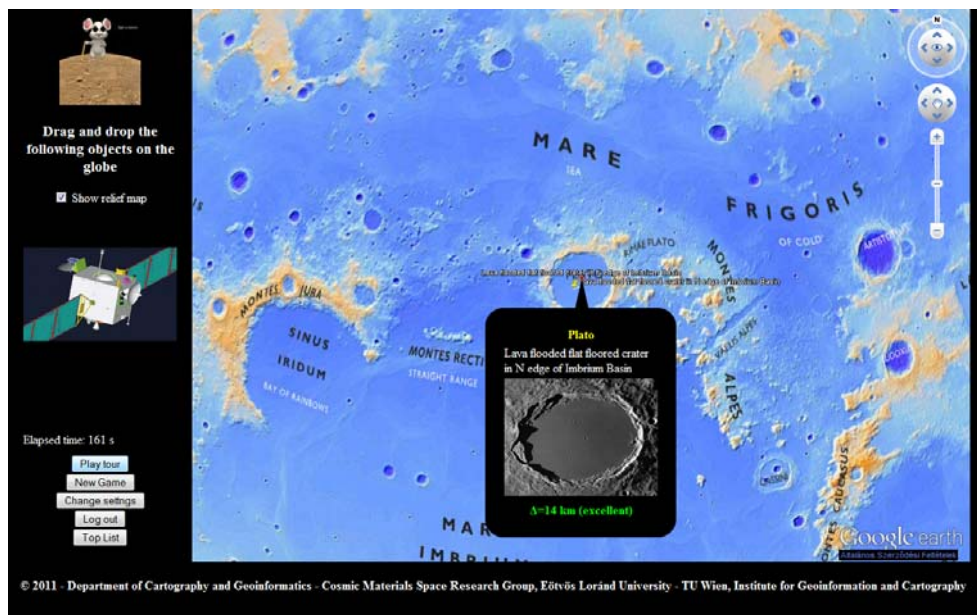


Figure 4. “Question” layout of the “Blind Mouse on the Moon” modul (<http://terkeptar.elte.hu/em>).

3. The Game

The aim of the game is to check our knowledge of positioning and identifying map features in two categories – Mars and Moon. Two types of game can be played on each of them. In the first one, players have to place ten points (defined by a short description) on the globe. The second one is a “planetary quiz”: four answers are given to every question; players have to choose the right one with the help of the digital planetary globe.

3.1. Game #1: Placing Points

In the original *Blind Mouse* and *3D Blind Mouse* game, players have to place points defined by their toponyms. In the planetary game, however, short descriptive texts identify the points (regarding either the physical landform or the origin of the eponym), as the toponyms can be found in the map. The ten points come one by one. Players can drag the placemark of the point to its supposed place on the virtual globe, while a clock shows the elapsed time.

The score is calculated from the average misplacement of the points and the time used to finish the game. Due to the educational nature of the game, a

short animated virtual trip ends the game: the virtual globe is rotated to each point, showing the misplacement and descriptive text.

3.2. Game #2: Planetary Quiz

The second game type is just like a traditional multiple choice quiz with ten questions and four answers to each question. The questions and answers are always related to a specific feature on the planet. Although it can be completed without any maps, the virtual planetary globe can help finding the right answers as related information can be found on the map.

Score is calculated from the number of right answers and the elapsed time. Just like in the other game type, at the end of the game it is possible to see an animated trip visiting all the subjects of the questions, once more showing the question and the right answer.

3.3. Top List

The air of competition always makes a game more interesting. Therefore, a “Top List” is also implemented to the Blind Mouse on Mars. Scores are stored separately for the different game types and planets.

4. Conclusion

Planetary surfaces are less known terrains for the general public despite a vivid interest in these subjects in the news and popular science media. Topographic knowledge on these areas – both planetary surfaces’ geological features and their toponyms – remain basically unknown for most people. This neocartographic 3D game uses elements of planetary science, cybercartography and edutainment to offer a platform for middle and high school pupils to study the surfaces of celestial objects; in the first stage, that of the Moon and Mars.

The game as a tool in education will be gradually implemented with additional modules into the courses on planetary morphology, astrogeology and astrobiology at Eötvös Loránd University and astronomy clubs.

References

Dombóvári E (2005) Interaktív térképrejtvények (MSC degree thesis). Eötvös Loránd University, Department of Cartography and Geoinformatics, Budapest, Hungary

- Google (2012) Google Earth API Reference.
<https://developers.google.com/earth/documentation/reference>. Last accessed 28 October 2012
- Hargitai H (2008) Astronomical facts and fallacies from pre-schoolers to elderly people, Új Pedagógiai Szemle [Csillagászati ismeretek és téveszmék óvodáskortól időskorig, in Hungarian] 58. 6-7. 2008. - 122-148.p
- Hargitai H, Gede M (2009) Multilingual Virtual Globes of Venus and Mars. Proceedings of the 24th International Cartographic Conference. Santiago de Chile, Chile, 15–21 November 2009
- Hargitai H (2012) Interpretation of Surface Features of Mars as a Function of Its Verbal—Toponymic—and Visual Representation. In: L. Zentai and J.R. Nunez (eds.) Maps for the Future, Lecture Notes in Geoinformation and Cartography 5. Springer: Berlin Heidelberg.
- Kereszturi Á (2009) Visualization in the education of Astrobiology in: Hegedus S and Csonka J (eds): Astrobiology: Physical Origin, Biological Evolution and Spatial Distribution. Nova Science Publishers.
- NASA (2012a) MOLA Homepage. <http://mola.gsfc.nasa.gov>
- NASA (2012b) Lunar Reconnaissance Orbiter (LRO).
http://www.nasa.gov/mission_pages/LRO/main
- Neumann A (2008), Web Mapping and Web Cartography. In: Shekhar Sh, Xiong H (eds.): Encyclopedia of GIS. New York, NY: Springer, 1261–1270.
- Russell G (2000) School education in the age of the ubiquitous networked computer. Technology in Society 22 (3) 389–400
- Shingareva KB, Zimbelman J, Buchroithner MF and Hargitai HI (2005) The Realization of ICA Commission Projects on Planetary Cartography. *Cartographica*, 40 (4). 105-114
- Simonné-Dombóvári E, Gede M (2010) The Blind Mouse – for developing and popularizing cartographical skills. In: *Cartography in Central and Eastern Europe – Lecture Notes in Geoinformation and Cartography*. pp. 473-484. Springer Berlin Heidelberg, 2010.
- Simonné-Dombóvári E, Gede M (2011) New Possibilities of Mute Map Games on Virtual Globes. In: Proceedings of the 25th International Cartographic Conference. Paris, France, 3–8 July 2011. ISBN: 978-1-907075-05-6
- Taylor DRF (2005) The theory and practice of cybercartography: An introduction. Modern Cartography Series 4, 1–13